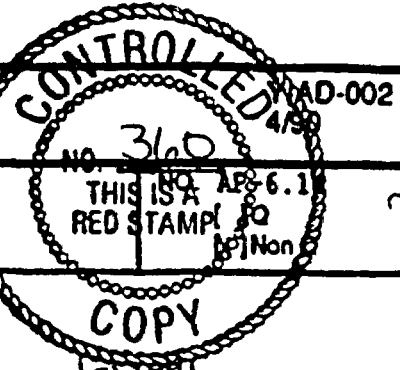


**YUCCA MOUNTAIN PROJECT OFFICE
DOCUMENT APPROVAL SHEET**



Title ADMINISTRATIVE PROCEDURE: REPORTABLE GEOLOGIC CONDITIONS

APPROVAL

PROJECT MANAGER: Maxwell Blanchard _____ Date _____
for C.P. Signature & date

DIRECTOR OF QUALITY ASSURANCE: N/A NV for DGH _____ Date 1/17/91
Signature

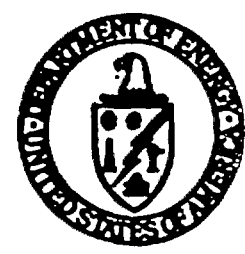
N/A _____ N/A _____ N/A _____
(OTHER, AS REQUIRED) Signature Date

REVISION 0 EFFECTIVE DATE: 2/1/91

REVISIONS

INITIAL AND DATE

	REVISION 1	REVISION 2	REVISION 3	REVISION 4
PROJECT MANAGER:	_____	_____	_____	_____
DIRECTOR, QA:	_____	_____	_____	_____
<u>(OTHER, AS REQUIRED)</u>	_____	_____	_____	_____
EFFECTIVE DATE:	_____	_____	_____	_____



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 PDR WASTE
 WM-11 PDR

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1.0 PURPOSE AND SCOPE

1.1 PURPOSE

The purpose of this procedure is to provide a process to document and report to appropriate agencies significant unexpected geologic conditions. This procedure fulfills the requirements related to such conditions as discussed in the Test and Evaluation Plan.

1.2 SCOPE

The scope of this procedure provides guidelines for identifying whether an unexpected geologic condition is reportable to the U.S. Nuclear Regulatory Commission (NRC) and other appropriate agencies, documenting subsequent actions, and notifying the agencies. It is understood that unexpected geologic conditions not reported to the NRC under this procedure will be studied and documented as part of normal site characterization investigations.

2.0 APPLICABILITY

This procedure applies to all Yucca Mountain Site Characterization Project Office (Project Office) staff and all Project Participants engaged in site characterization activities in which unexpected geologic conditions of interest may be encountered. These activities include construction of the Exploratory Shaft Facility (ESF) at the Yucca Mountain Site (Site); construction of the ESF shafts, ramps, and drifts; surface-based drilling and trenching, and other test and evaluation activities, whether on the surface or underground, that are related to site characterization. Some of these site characterization activities may be performed at locations away from the Site.

This procedure is applicable during the pre-license application phase of the Yucca Mountain Site Characterization Project (Project), i.e., the period before the U.S. Department of Energy (DOE) submits a license application to the NRC.

This procedure does not cover unusual occurrences, which are addressed by Project Administrative Procedure (AP) AP-2.9, Reporting of Unusual Occurrences.

3.0 DEFINITIONS

NOTE: Terms in this procedure are used as defined in the Project Glossary. The following additional definitions are adopted for the purposes of this procedure.

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3.1 REPORTABLE GEOLOGIC CONDITION

For purposes of this procedure, a geologic condition relates to geology-related fields such as hydrology, geochemistry, tectonics, and rock mechanics. A reportable geologic condition is one that is determined to be significant and requires notification of the NRC and other agencies, as appropriate. Such a condition is one that if not investigated in a timely manner could result in the loss of data relevant to characterization of the Site.

3.2 SIGNIFICANT (OR SIGNIFICANCE)

The term "significant" as applied to unexpected geologic conditions means that a specific condition is so different from the predicted or expected range of values or events that it may (1) impact the design and construction of the ESF, waste package or a geologic repository, (2) have a potentially adverse impact on the ability to characterize the Site or on the isolation capability of the Site, (3) be judged to be a potential deficiency in the characteristics of the Site that could, if not further examined and evaluated or corrected, be considered a substantial safety hazard or represent a significant deviation from the established design criteria and basis, or (4) be judged to be sufficiently relevant to site characterization such that acquisition of additional data would be required to document the condition.

3.3 DELAY OF WORK

A delay of work is a temporary work stoppage during which a potentially reportable geologic condition may be investigated and evaluated for significance. The length of the work delay will depend on the amount of time needed to determine the significance of the geologic condition being investigated and to decide on the appropriate course of action to follow if the condition is determined to be significant.

4.0 RESPONSIBLE PARTIES

The following Project individuals or organizations are responsible for activities identified in Section 5.0 of this procedure:

1. Project Participant
2. Field Testing Coordinator (FTC)
3. Site Investigations Branch (SIB) Chief (SIBC)
4. Project Participant Principal Investigator (PI)
5. Regulatory and Site Evaluation Division (RSED) Director (RSEDD)

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5.0 PROCEDURE

NOTE: A flowchart of the following processes described in this procedure is attached as Figure 1.

<u>RESPONSIBLE PARTY</u>	<u>STEPS</u>	<u>PROCEDURE</u>
Project Participant	1.	Notify the FTC if a potentially reportable geologic condition is encountered.
FTC (or designee)	2.	Following notification of a potentially reportable geologic condition, make a preliminary assessment of the significance of the condition. a. If it is determined that the condition is not significant, complete Section 1 of the report form (Attachment 1) and transmit a copy to the SIBC and Project Office Local Records Center (LRC). Exit procedure. b. If it is determined that the condition is significant, proceed to Step 3.
	3.	Determine if additional data is needed to assess significance of the condition and/or if work should be delayed. a. If additional data or a work delay is needed, consult affected parties, issue appropriate instructions, and notify the Site Manager (SM), RSEDD, SIBC and appropriate PI. Proceed to Step 4. b. If there is no need for additional data or a work delay, proceed to Step 4 and skip Steps 9 and 10.
	4.	Complete Section 1 of the report form (Attachment 1) and transmit to the SIBC.

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<u>RESPONSIBLE PARTY</u>	<u>STEPS</u>	<u>PROCEDURE</u>
SIBC	5.	Review, in consultation with the FTC, RSEDD, and the Project Manager (PM), as appropriate, the description of the reportable geologic condition, the evaluation, and the decisions and actions already taken.
	6.	Notify, immediately, affected parties and FTC of modifying instructions, if required.
	7.	Complete Section 2 of the report form (Attachment 1) and transmit to the RSEDD with copies to the SM, FTC, and PI.
	NOTE:	If it is determined that replanning or rescheduling of the related activity is necessary, the SIBC will coordinate necessary actions.
	8.	Coordinate notification of the NRC on-site representative (NRC/OR) and other agencies, as appropriate, of the geologic condition under investigation, its potential significance, and the actions taken. Notification can be made by telephone with subsequent written confirmation. Notification of the NRC/OR and other agencies shall be documented in Section 3 of the report form (Attachment 1).
	NOTE:	The PM shall determine what other agencies should be notified and how notification will be made.
	NOTE:	The NRC/OR and other appropriate agencies shall be given the opportunity to view the actual geologic condition of interest at the earliest opportunity.
PI	9.	Upon completion of data collection, notify SIBC and FTC.

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<u>RESPONSIBLE PARTY</u>	<u>STEPS</u>	<u>PROCEDURE</u>
	10.	Prepare and transmit a letter report to the SIBC with a copy to the FTC, indicating the results of data collection.
SIBC	11.	Review, in consultation with the RSEDD, the report form (Attachment 1) and other additional, pertinent information. Determine acceptability of the response activity.
	NOTE:	Includes resubmittal of documentation after actions, in accordance with instructions of Step 11a, are performed.
	a.	If completion of the response activity is not acceptable, issue instructions to affected parties for any action that is necessary to complete the response activity. Document any actions in Section 4 of the report form (Attachment 1). When the response activity is acceptable, proceed to Step 12.
	b.	If completion of the response activity is acceptable, notify the PI, FTC, and SM. Proceed to Step 12.
	12.	Sign Section 4 of the report form (Attachment 1), indicating approval, and transmit to the RSEDD.
RSEDD	13.	Sign and date Section 4 of the report form (Attachment 1) to indicate approval of actions taken.
SIBC	14.	Notify the NRC/OR and other agencies, as appropriate, of (1) any changes to the information they had previously received regarding response to the geologic condition under investigation, (2) additional actions taken to complete the response activity, and (3) results and

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<u>RESPONSIBLE PARTY</u>	<u>STEPS</u>	<u>PROCEDURE</u>
	15.	conclusions of the evaluation of the condition. Document notification in Section 3 of the report form (Attachment 1). Submit Attachment 1 and any supporting documentation to the Project Office LRC.

6.0 REFERENCES

NOTE: Refer to the latest revision of the documents listed below unless otherwise state.

6.1 REQUIREMENTS DOCUMENTS

Project Records Management Plan, YMP/88-15

Test and Evaluation Plan, YMP/90-22

6.2 INTERFACE DOCUMENTS

AP-2.9, Reporting of Unusual Occurrences and Unplanned Events

Project Glossary, YMP/89-15

7.0 FIGURES AND ATTACHMENTS

Figure 1, AP-6.14 Flowchart

Attachment 1, Report of Unexpected Geologic Conditions

8.0 RECORDS

All reports of reportable geologic conditions encountered at the Site, as defined in this procedure, shall be documented and made part of the permanent Project records in accordance with the Project Records Management Plan (YMP/88-15). This documentation shall include the report form(s) and copies thereof, all subsequent reports or information on the geologic condition, all records produced as a result of additional data collection activities, and copies of any notifications sent to the NRC/OR and State of Nevada. The completed record package shall be submitted to the Project Office LRC.

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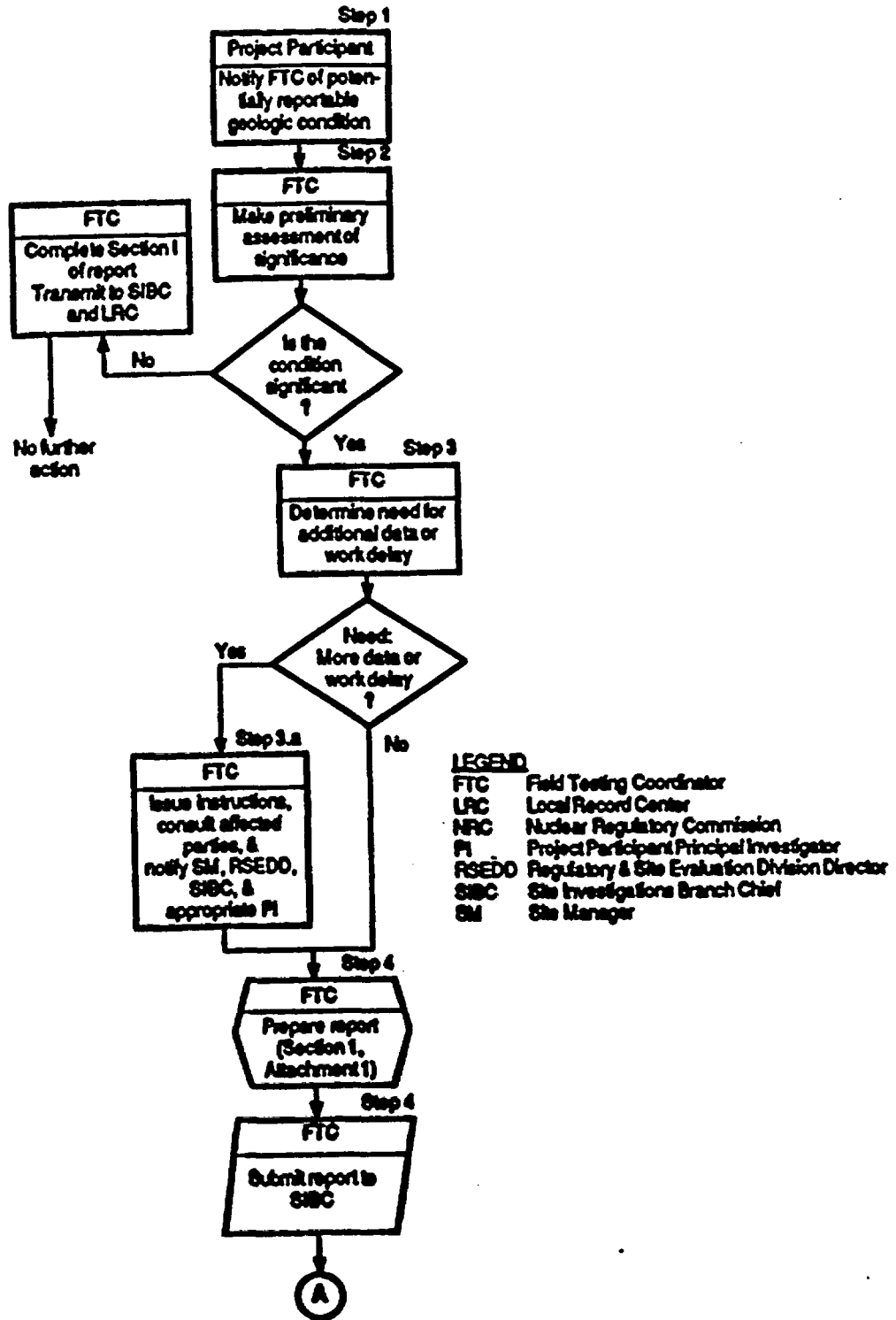


Figure 1 - AP-6.14 Flowchart

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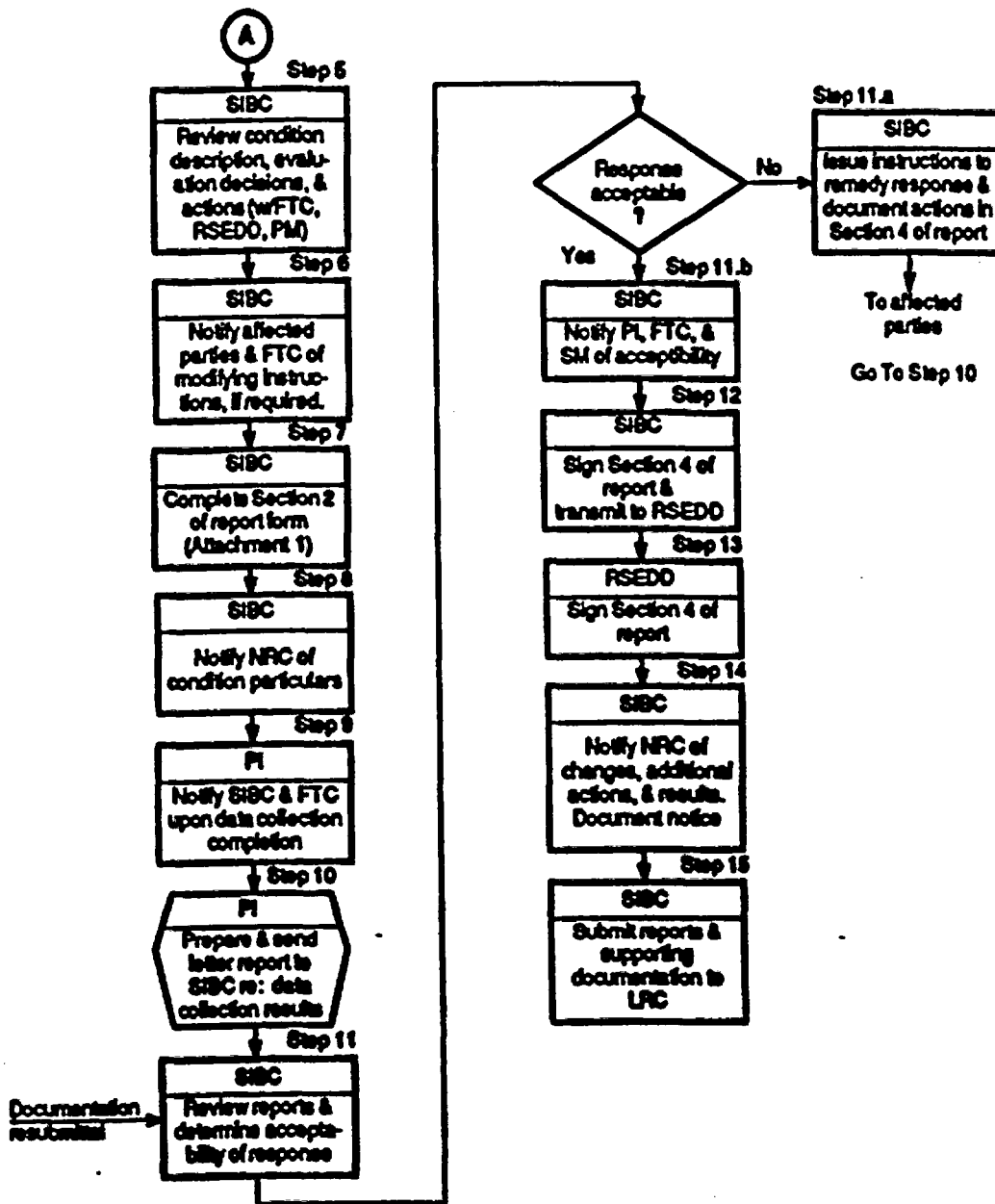


Figure 1 - AP-6.14 Flowchart (continued)

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SECTION 1. INITIAL RESPONSE		
Initiator _____	Phone _____	Time _____ Date _____
Location _____		
SCP Study Number _____ (if applicable)	CI Number _____ (if applicable)	
Description of condition or phenomenon:		
Evaluation:		
Potential significance of condition:		
Recommendation:		
Action taken:		
Signature _____ Field Testing Coordinator		

AP-6.14

Attachment 1 - Report of Unexpected Geologic Conditions

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**REPORT OF UNEXPECTED GEOLOGIC
CONDITION**

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SECTION 2. CONCURRENCE

Evaluation:

Approval/Disapproval:

Action taken:

Signature _____ Date _____
SB Chief

SECTION 3. NOTIFICATIONS

Initial Notification of Geologic Condition:

NRC/OR _____ Date _____ Initials _____

Other _____ Date _____ Initials _____

Notification of Response Activity Results and Conclusions:

NRC/OR _____ Date _____ Initials _____

Other _____ Date _____ Initials _____

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SECTION 4. RESPONSE CLOSEOUT

Action Taken:

Signature _____
S&B Chief

Date _____

Signature _____
RSED Director

Date _____

AP-6.14.

REPORT OF UNEXPECTED GEOLOGIC
CONDITION

SECTION 1. INITIAL RESPONSE

Initiator Susan B. Jones, Chief, RIB Phone 702-794-7613 Time 10:00 am Date June 29, 1992

Location Yucca Mountain Site Characterization Project Office, Las Vegas, NV

SCP Study Number N/A
(if applicable)

CI Number N/A
(if applicable)

Description of condition or phenomenon: See Attachment

Evaluation: See Attachment

Potential significance of condition: See Attachment

Recommendation: See Attachment

Action taken: See Attachment

Signature J. Timothy Sullivan DOE/RSED
Field Testing Coordinator

Attachment to AP 6.14, Section 1

Description of Condition or Phenomenon:

On June 29, 1992 at approximately 3:14 AM Pacific Daylight Time, an earthquake occurred in the Yucca Mountain region (see Attachment No. 1). The event was located at 36.718 degrees North latitude and 116.289 degrees West longitude, near Little Skull Mountain. The depth was calculated at about 9 kilometers. The earthquake epicenter is spatially associated with the Rock Valley Fault System. The earthquake produced an oscillation in the groundwater level of greater than +/- 0.8 ft as recorded at wells USW H-5 and H-6. The groundwater level returned to its near pre-earthquake level within about 30 minutes.

Evaluation:

The condition has been evaluated as not significant in accordance with AP 6.14, Reportable Geologic Condition. The earthquakes at Little Skull Mountain provide a wealth of new information on the seismic characteristics of the Yucca Mountain region. The lack of surface faulting, along with the source properties of the mainshock, will help constrain observations of paleoseismic events on other nearby faults. Recordings of the mainshock and aftershocks will support site specific analyses of ground motion and attenuation for similar and larger events. They will allow uncertainties in assessments of seismic hazard to be reduced.

Potential Significance of Condition:

The term significant as applied to unexpected geologic conditions means that a specific condition is so different from the predicted or expected range of values or events that it may:

1. Impact the design and construction of the ESF, waste package or a geologic repository - The design of the ESF, waste package, and the repository were not impacted by this condition. Earthquakes of this size are expected to occur near the site. Preliminary estimates of the peak horizontal accelerations produced by this earthquake are in the range of 0.10 to 0.16g. The design value used in the preliminary conceptual designs was 0.4g, which is significantly larger than experienced during the June 29, 1992 event. Based on our current understanding of the tectonic framework for the site, design values of 0.5 to 0.6g may result from seismic hazard evaluations carried out as part of the site characterization program.
2. Have a potentially adverse impact on the ability to characterize the site or on the isolation capability of the site - The Little Skull Mountain earthquake produced no impact on our ability to characterize the site or on the isolation capability of the site.

It caused architectural damage to several buildings, but did not significantly delay site characterization activities. No damage was experienced at the sites of ongoing drilling. This earthquake epicenter was located about 15 kilometers from the boundary of the proposed repository. No surface rupture was observed during aerial and ground surveys carried out after the event. Oscillations in the groundwater level, as recorded in wells USW H-5 and H-6, were in excess of +/- 0.8 ft, but returned to near pre-earthquake levels within about 30 minutes (see Attachment No. 2).

3. Be judged to be a potential deficiency in the characteristics of the site that could, if not further examined and evaluated or corrected, be considered a substantial safety hazard or represent a significant deviation from the established design criteria and basis - The magnitude 5.6 earthquake beneath Little Skull Mountain is the type of earthquake that should be expected to occur occasionally in the vicinity of Yucca Mountain. The design ground motion used for the preliminary conceptual design is significantly larger than that produced by the Little Skull Mountain event.
4. Be judged to be sufficiently relevant to site characterization such that acquisition of additional data would be required to document the condition - Collection of data from earthquakes occurring in southern Nevada is addressed by Study Plan 8.3.1.17.4.1. In accordance with that plan, portable seismic monitoring instruments were deployed in the epicentral region on the day after the earthquake. Data from these instruments will provide detailed information on aftershocks, and help characterize seismic source parameters and attenuation in the Yucca Mountain vicinity. Ground and aerial surveys were also carried out by the Department of Energy, the U.S. Geological Survey, the Nevada Bureau of Mines and Geology, and the University of Nevada - Reno to look for surface rupture and displaced boulders associated with the earthquake. No evidence of surface rupture was identified. Some evidence of displaced boulders was found at Little Skull Mountain and on the West side of Yucca Mountain 1 to 3 miles south of the proposed repository block, but not at the crest of Yucca Mountain. Collection of data beyond that covered by the Study Plan is unnecessary.

Recommendation:

None

Action Taken:

The DOE is investigating the earthquake in accordance with Study Plan 8.3.1.17.4.1. The epicentral area has been surveyed from the air and ground for evidence of surface faulting and boulder movement. Personnel from the U.S. Geologic Survey and University of Nevada-Reno have deployed seismic monitoring instruments to record aftershocks. Data from these studies will be analyzed and presented through oral and written reports to the scientific and institutional communities.

E533840ft
E540800m

E566660ft
E550000m

E599475ft
E560000m

36° 52' 30"

36° 45' 00"

36° 37' 30"

116° 30' 00"

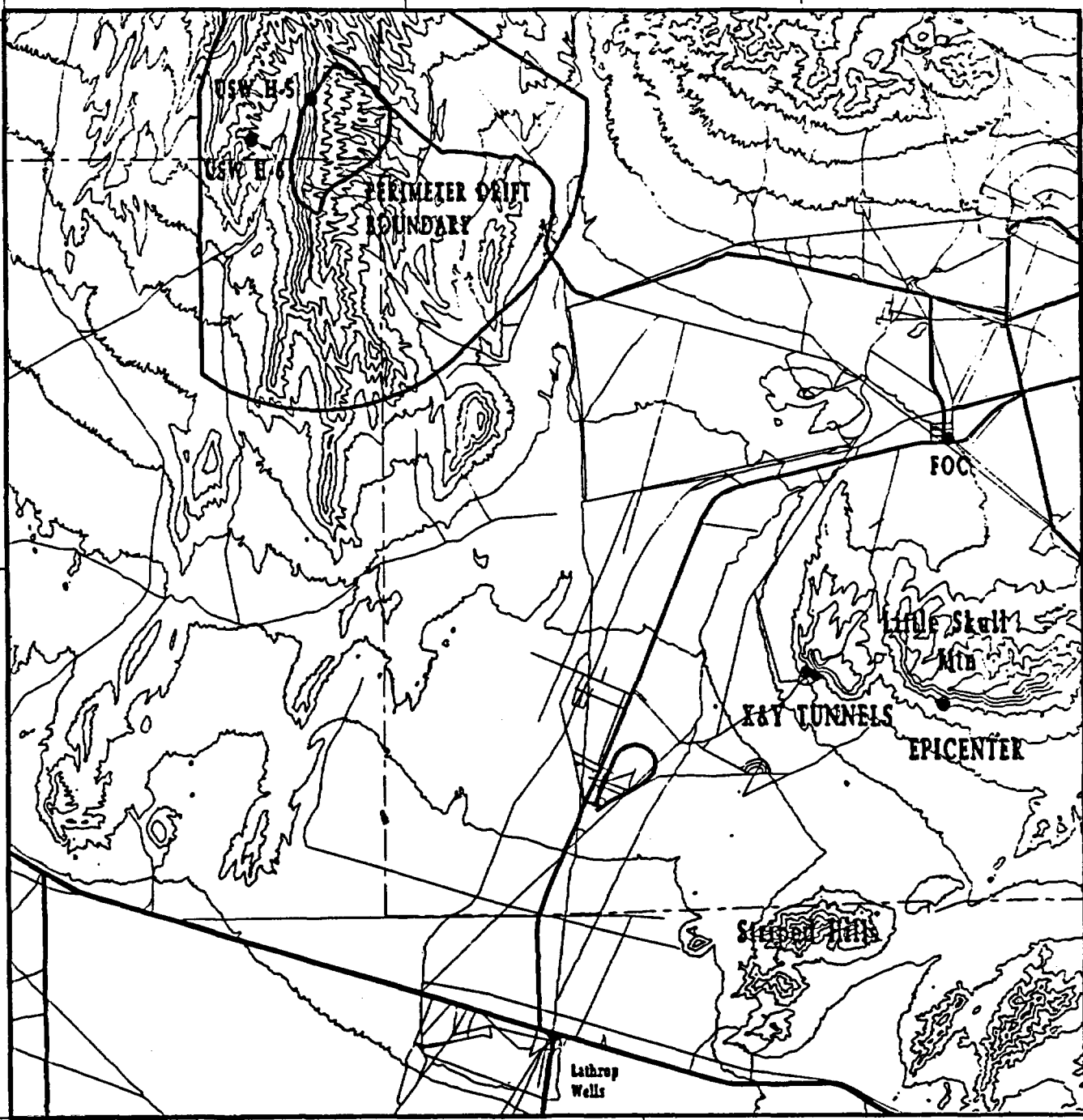
116° 22' 30"

116° 15' 00"

N770210ft
N400000m

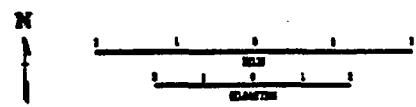
N73735ft
N407000m

N704590ft
N406000m



X Tunnel Orientation: North 36 degrees East
700 feet long
Y Tunnel Orientation: North 19 degrees East
150 feet long

Relation of 6/29/92 Epicenter to X&Y Tunnels



Earthquake Information

Water Level Response Information

Well/ Zone	Date/ Time (PDT)	Magnitude	Double Amplitude (ft)	Maximum Rise (ft)	Maximum Fall (ft)	Apparent offset in water level @ 120 min (ft)
H-5 upper	06/29/92 03:14:22	5.6	>1.12	>0.65	0.46	+0.07
USW H-5 Lower			>1.73	>0.88	>0.84	+0.07
USW H-6 Upper			0.71	0.59	0.12	+0.03
USW H-6 Lower			>1.73	>1.28	>0.45	+0.06
USW H-5 Upper	06/29/92 03:31:02	4.4	0.09	0.04	0.05	0.0
USW H-5 Lower			0.54	0.33	0.20	0.0
USW H-6 Upper			0.06	0.03	0.03	0.0
USW H-6 Lower			>1.68	0.96	>0.72	0.0

Estimated distance of well to earthquake epicenter 16-19 miles